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ABSTRACT

A study examined whether illustrations that must be attended to in order to make sense of a text hinder decoding by encouraging dependence on such illustrations for interpretation of text, both for decoding and for answering questions. Subjects--167 first graders--were asked to read four stories, two of which were taken from basal readers and two of which were children's trade books. One trade book and one basal story each had illustrations that were crucial to story comprehension, and one of each had nonessential, or redundant, illustrations. The stories were presented to each child in one of four versions: text only, illustrations only, text plus illustrations, and revised text. After the students read the story aloud, they were given an oral comprehension test and asked to read a list of five words taken from the story. Decoding errors and reading time were recorded. Results showed that first graders who read poorly answered comprehension questions better when the texts they read were illustrated, and about equally well regardless of whether the illustrations were redundant or crucial; good readers answered more questions correctly on texts that did not depend on crucial illustrations, regardless of whether or not the illustrations were actually present. (HOD)

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CENTER FOR THE STUDY OF READING

Technical Report No. 355

INTERACTIONS OF TEXT AND ILLUSTRATION IN BEGINNING READING

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Abstract

Previous work investigating the effects of illustrated text among beginning readers has either focused on learning to read isolated words, or, if focused on effects on comprehension, has been inconclusive. A likely reason for this is that no distinction was made between images that illustrate content described in the text, and illustrations that represent material that is not represented in the text, but which is crucial to understanding the passage. The research reported here indicates that first graders who read poorly can answer comprehension questions better when the texts they read are illustrated, and about equally well regardless of whether the illustrations are redundant or crucial, while good readers answer more questions correctly on texts that do not depend on crucial illustrations, regardless of whether the illustrations are actually present or not. This suggests that good readers have learned to ignore the illustrations, while poor readers, either as a cause or an effect of their limited ability, depend on illustrations to interpret the text they read. This implies that the use of both crucial and redundant illustrations, but especially of crucial illustrations, in material for teaching reading should be re-evaluated in light of the risk it poses of encouraging a crippling strategy of illustration-dependence.

Interactions of Text and Illustration in Beginning Reading

Illustrated or Unillustrated Texts?

The value of illustrated text in teaching children to read is almost taken for granted (Miller, 1937; Samuels, 1968). All major basal reading series provide illustrated readers for beginning reading instruction. Chall (1967, p. 209) notes that interpretation of accompanying illustration comprises a significant portion (10-30%) of the guidance and comprehension evaluation in pre-primer to second grade basals, and is generally the subject of the first qustion asked about a selection. Periodically since the 1920s research has been undertaken to evaluate that assumption, but most of it has addressed very limited issues, much has been inconclusive or contradicted, and none of it has significantly affected instructional materials or practice.

Why are illustrations supposed to be helpful or necessary in beginning reading instruction? Apparently, the reasons assumed are among the following (Goodykoontz, 1936, p. 125; Miller, 1937):

Pro 1. Illustrations make a book attractive.

Pro 2. Illustrations motivate a child to read the accompanying text.

Pro 3. Illustrations provide clues for the decoding of unfamiliar words.

Pro 4. Illustrations can represent aspects of a story which would require more length or difficult vocabulary than is considered suitable for readers at that level.

On the other hand, the following assumptions support the opinion that illustrated text hinders the process of learning to read:

Con 1. Illustrations distract the child from the text. (Miller, 1937)

Con 2. Illustrations hinder development of word recognition skills by making it possible to correctly identify words from illustrations, without decoding them. (Samuels, 1968)

Con 3. Copious illustrations hinder development of both decoding and comprehension skills by making it possible to infer a coherent story substantially or exclusively from the pictures. (Bluth, 1972)

Research has addressed most of these issues. We will summarize some of this briefly, and then discuss in more detail issues raised by assumption Con 3.

Previous Research

Research concerning the notion that illustrations make a book attractive to children has mainly focused on what topics and styles of illustrations (colorful, black and white, photographic, realistic, fanciful, line drawings, etc.) children prefer (Spaulding, 1955; Bloomer, 1960). It has been (probably correctly)

assumed that they prefer illustrated to unillustrated text, although one artist has argued that illustrated books stifle artistic creativity in children (Mangravite, 1926).

Schallert (1980) provides a critical discussion of the research that is used to argue that illustration hinders the acquisition of word-recognition skills, but concentrates on the effects of illustration on learning the content of texts. She cites studies which show that the effect of illustration depends (not surprisingly) on what kind of information the illustration represents (information also represented in the text, information not represented in the text but uninterpretable without the text). She concludes that

> pictures are likely to help readers learn from written material if they represent spatial information or information which is important to the total message. In addition, there may be differences in the effectiveness of illustrations between situations in which the information to be derived from a picture is explicitly repeated by the text and situations in which the text merely provides the framework for certain information left to be derived from appropriate illustrations. (p. 519)

Jagodzinska (1976) found that schematic illustration of essential information increased learning, while schematic illustration of non-essential information decreased learning, and realistic illustration of non-essential information increased

learning of it. In general, she found, supplementary illustrations tend to depress learning of essential information.

Samuels (1968) summarizes a number of studies which tend to show that illustrations interfere with learning of sight vocabulary. Singer, Samuels, and Spiroff (1973-74) report a study which supports Samuels' theory that picture and context clues deter acquisition of reading responses to print because they allow identification of words without focusing on their graphemic properties. Montare, Elman, and Cohen (1977) challenge some of Samuels' assumptions and implications, and report results which show that the illustration of connected text, as opposed to words out of context, does not affect word recognition performance at either first- or third-grade level.

Denberg (1976-77) found that incomplete illustrations for isolated sentences facilitated acquisition of sight word vocabulary for first graders who had some decoding ability.

Considering now research on the effects of illustration on comprehension, Miller (1937) claimed to show that first- through third-graders who had one semester of instruction with unillustrated readers (the illustrations were obliterated by pasting paper over them) displayed the same ability on end of semester evaluations as control groups using the texts in their natural (illustrated) state. It is worth noting, however, that the tests were not very subtle or specific. Two involved identifying isolated words. A third involved completing sentences

after reading a paragraph, and a fourth involved ordering the events in a paragraph (a task it is often possible to perform correctly without reading the paragraph at all, just on the basis of knowledge of likely relations among events).

Halbert (1943) criticized Miller's comprehension tests, and using a free recall task, found that children with second- through fourth-grade reading ability got more relevant ideas from reading illustrated stories than from the story alone or the illustrations alone.

Strang (1941), using four multiple-choice questions per story, found that more fourth- through sixth-graders did better in comprehending texts illustrated with static, realistic illustrations (photographs) than did worse when they read (different) unillustrated stories. (595 children read three illustrated and three unillustrated texts. More did better on the illustrated texts than did worse; 130 showed no difference.) Of perhaps more interest, it took good readers more time to read illustrated stories than unillustrated, while it took poor readers less time.

Weintraub (1960) used ten multiple choice questions per story and found that poor readers displayed better comprehension of unillustrated text than illustrated text, while high IQ, low reading achievement subjects did equally poorly on illustrated text, unillustrated text, and illustrations alone. He inferred from this that the presence of illustrations prompted these

children to ignore accompanying written text to an extent that poor readers may not bother to read when an illustration is present to be interpreted (p. 60).

Lindseth (1969) found that pictures were not sufficient to answer free-response comprehension questions, except perhaps in first grade, but did not compare illustrated text and illustrations only conditions.

Bluth (1972), using a cloze test for comprehension, found that a certain illustrated passage was comprehended better by good second-grade readers than a different unillustrated passage, but equally poorly by poor readers. Unfortunately, since the research did not control for passage effects, it is not really informative about the effects of illustrations. With the exception of Schallert (1980) and Jagodzinska (1976), none of the research we have seen reported distinguishes among kinds of relations the illustrations might have to the text which they accompany. And yet, it is clear that illustrations can serve at least three functions in texts for children. First, they can be merely decorative, intended to make the book a bi-modally aesthetic object, or to entice the reading child into reading the text, and the pre-reader (or even the pre-verbal child) into sitting still to be read to. Indeed, parents who read to their toddlers know that they need to choose books partly on the basis of the ratio of text to distinct illustrations.

Second, illustrations may recapitulate part or all of the story or text they accompany. This may function (perhaps unintentionally) to aid the beginning reader (or language learner) in decoding or understanding the text, by providing a sort of standard to compare their interpretation of the text to. It may aid the pre-verbal child in figuring out the referents of the new words in stories that are read aloud.

Finally, inferences that can be made from illustrations, or from illustrations taken in conjunction with segments of text, may represent a crucial and integral part of the story which is not presented in the written words of the text. This is typically the case with comic books, but is not rare in much more highly esteemed forms of literature for children. In fact, a public children's library will probably contain many story books such as Ezra Jack Keats' Skates! or Mercer Mayer's A Boy, a Dog, and a Frog, which have no text whatever.[1]

Since the amount of non-redundant (crucial) information represented in the illustrations which are intended to accompany a text provides a limiting factor on comprehension scores for the text-only condition in text/text-plus-illustrations comparisons, it is unfortunate that the research reports are silent on this critical property of the materials they used. We were able to examine some of the materials which Halbert and Weintraub used, and they vary widely. The examples which Halbert provides display a low ratio of illustration to text. The illustrations, while

not misleading, provide very little information; certainly none of it is crucial for understanding the text. The one of Weintraub's stories that we tracked down ("The House Trailer" from Our Town, Allyn, & Bacon, 1960) turned out to be a story where over 30% of the important ideas were not provided by the text, but only by the illustrations. If all of the stories were like that (which may or may not have been), one would not expect the text-only condition to yield better comprehension scores than the text-plus-illustrations condition, as Weintraub found it did for poor readers, but effects of the comprehension questions may have swamped any effects of this aspect of the materials. Examination of the ten multiple choice comprehension questions for "The House Trailer" show several to be poorly chosen or constructed, and difficult to answer correctly or rationally from either the text or the illustrations.

Hypotheses

Examination of primary-level basal readers from several popular series in current use showed that the use of redundant illustrations was universal, and that frequently the brilliantly colored illustrations overwhelmed the 20% to 40% of the page occupied by the text. More important, the use of crucial illustrations is widespread, especially in first-grade primers and readers. The crucial issue, as we saw it, was not so much 'Does the presence of illustrations hinder the learning of sight words on a case by case basis?' (the focus of the research

inspired by Samuels), but rather, 'Does the presence of illustrations that must be attended to in order to make sense of a text hinder the practicing of decoding by ENCOURAGING A STRATEGY OF DEPENDING ON ILLUSTRATIONS for interpretation of text, both for decoding and for answering questions about the story?' This strategy is penny-wise and pound-foolish, since as texts get more complex and get lower illustrations-to-text ratios, as they do in graded reading series, the strategy proves less and less effective; "readers" who have committed themselves to it fall farther and farther behind their classmates who have been learning, practicing, and internalizing principles of decoding (phonics) and strategies of comprehension for connected text. Readers who continue to depend on this strategy will not display a very high level of ability or achievement. We hypothesized that some poor readers might be poor readers BECAUSE they depend on this strategy. If this is so, we would expect them to do equally well understanding texts with crucial and with redundant illustrations, as long as the illustrations are present. If good readers have learned to ignore illustrations and rely on text for interpretation, we would expect them to do better on texts that did not depend on the interpretation of crucial illustrations, regardless of whether the illustrations were provided or not. The present study is a test of this hypothesis.

Subjects

The subjects were 167 first graders enrolled in several public schools in the vicinity of Champaign-Urbana, Illinois. They were all assigned by their classroom teachers to reading groups on the basis of their reading ability. These groups are referred to as high (above average), medium (average), and low (below average). Each child participated in one of the four conditions described below.

Materials

Four stories were used; they will be referred to below as UH ("Unfortunately Harriet"), PJ ("The Pet in the Jar"), PS ("Play School"), and LH ("Little Hippo"). Two of these stories were taken from basal readers, and two were children's trade books. One trade book and one basal story each had illustrations which were crucial to the understanding of the story, and one of each had non-essential, or redundant, illustrations. We identified the stories with crucial illustrations as such when we found that they made little or no sense to us when read without referring to the illustrations. An example from the experimental materials is the following excerpt from PS.

> "Good-by, Rags," said Ricky. "Away we go to school. Good-by! Good-by!"
>
> "Ricky! Ricky!" said Mother. "Come home, Ricky. You can not go to school. You are too little."
>
> "Come, Midnight," said Ricky. "We can not go to school. We are too little. We will go and play with Rags. We can play school at home."

> "My, my," said Mother. "I see a little school."
>
> Ricky said, "Come in, Mother. This school is my play school. Rags comes to this school. Midnight comes to this school. And you can come to this school."
>
> "Help! Help!" said Mother. "Down I go!"
>
> "Mother, Mother," said Ricky. "This is funny! We can not go to school. We are too little. And you can not play school. You are too big."

An excerpt perhaps even more striking, from a popular children's trade book, is reproduced in Appendix A. Appendix B contains the complete texts of the four stories used as experimental materials. Story length varied widely, from 180 words (LH) to 605 (PJ). The average length was 313 words. Number of illustratons per story ranged from 5 (LH) to 23 (PJ); the average number was 14. The number of words per illustration ranged from 11.05 (UH) to 36.00 (LH), with the average being 25.66. Readability scores (both Fry and Spache scores were computed) ranged from low grade one (for PS and LH) to upper grade two or lower grade three (for LH). Characteristics of the four stories are summarized in Table 1.

Insert Table 1 about here.

The stories were presented to each child in one of four versions:

1. Text only (T): The text of each story was retyped verbatim and presented without illustrations.

2. Illustrations only (I): The stories were presented with the text removed so the subjects could only see the illustrations. This was accomplished for the two trade books by gluing strips of heavy construction paper over the text, and for the two basal stories by xeroxing them with the text covered. In these two cases, the pictures were then painted with water colors to resemble the originals as closely as possible.

3. Text + illustrations (TI): In this condition, the two trade books were presented in their published forms, i.e., with both text and illustrations. The two basal stories were xeroxed and, as in the illustrations only condition, the illustrations were colored to resemble the originals.

4. Revised text (rT): In this condition, only the two stories with crucial illustrations (UH and PS) were used. The stories were presented retyped and without illustrations, as in the T condition, but edited so as to include the content of the crucial illustrations. We strove to make these revisions stylistically unobtrusive. This condition, then, utilized only two stories while the other three conditions each had four.

Procedures

Each day of the testing, four experimenters administered tests to a number of children. Each experimenter worked with just one of the four conditions. The reading groups were divided as equally as possible among the four conditions.

Each child was asked to read aloud (or, in the case of the I condition, to look carefully at the pictures of) one of the stories. The experimenter listened and kept track of decoding errors and reading time. When the child had finished reading, a short oral comprehension test was administered. Upon completion of the comprehension test, the child was asked to read a list of five words taken from the story. The procedure was then repeated for each of the other stories. The children varied greatly in the amount of time required to complete the task, ranging from roughly thirty minutes to over an hour. Some children chose not to complete all four stories; others, although they couldn't (or wouldn't) sit still long enough to do all four stories at one sitting, were willing to come back again and finish on another day, or later in the same day. Of the 167 children who participated, only 9 did not complete the task, and of these, 7 completed the testing procedure for at least two stories.

The comprehension tests varied in length from 13 questions (PS) to 22 (UH), depending on the length or complexity of the story. All questions required open-ended responses. Although multiple-choice tests would have much easier to evaluate, we felt it important not to put words into the children's mouths.

The questions were designed to test the children's memory of the events of the story and comprehension of their meaning or

importance to the story. See Appendix C for the complete questionnaires.

Questions were of four types:

A. Questions whose answers could be found only in the text.

B. Questions whose answers could be determined only from the illustrations.

C. Questions whose answers were equally available from either text or illustrations.

D. Questions whose answers were unavailable from either source.

Type B of course applies only to the two stories with crucial illustrations (UH and PS) and type C only to the TI condition. Some questions in each classification could be answered directly from material contained in a sentence, paragraph, or illustration, while others could only be answered through inference from text and/or illustration. Although the questions asked were the same for each story regardless of condition, their classification varied by condition. An example is question #1 for UH: "At the beginning of the story, what was the little girl doing with the varnish?" In the published version of UH (used for the TI condition), the answer to this question ("She was varnishing her rocking horse") is found only in an illustration. Hence, this question is type B for TI and I, where the illustrations are present, but type D for T, where there are no

illustrations. However, this question is type A in the rT condition, where the information from the illustrations was incorporated into the text. Similarly, question #15 for UH ("What did she do [after realizing that the varnish would stick to the furniture?"]) is type A for T and rT, type B for I, and type C for TI, since its answer ("She moved the furniture away from the spot") is equally available from both text and illustration in the published version--meaning that it is clearly apparent in all four conditions. In a similar manner, the questions varied from one condition to another in regard to whether they could be answered directly from text and/or illustrations or by inference from either source or both. Table 2 displays more completely the distribution of question types by condition and story. The question types averaged among the conditions as follows. UH: 55% available from text alone, 23% available from illustrations alone, 9% available from both, and 14% available from neither; PJ: 47% text, 20% illustrations, 20% both, and 13% neither; PS: 62% text, 23% illustrations, 11% both, and 8% neither; LH: 43% text, 21% illustration, 21% both, and 14% neither. The questions for UH averaged 64% which could be answered directly from text or illustrations, 23% whose answers could only be inferred from either text or illustrations, and 3% which were mixed in this regard. For PJ the numbers are: 67% direct, 20% inference, and 2% mixed; for PS: 46% direct, 31%

inference, and 8% mixed; and for LH: 43% direct, 36% inference, and 7% mixed.

Insert Table 2 about here.

Analysis of Data

The scores for the comprehension and vocabulary tests were analyzed with reference to the students' reading ability groups, story, and condition. Each variable was individually important, having significance factors of .001. In general, 2- or 3-way interactions (i.e. condition/story, condition/reading group, story/reading group, or all three together) did not prove to be significant. Exceptions to this observation will be discussed below.

Comprehension Test

Answers to the comprehension questionnaire were given one of three possible scores: 0 for incorrect, 1 for partially correct, or 2 for fully correct. As mentioned above, the questions were intended to test the children's ability to remember and understand the story and to test which was understood and remembered best. The questions, then, were designed to be and were interpreted as being prompters to the child's memory of the stories. This means that if a particular question was answered incorrectly, but the partial or complete answer to that question was given elsewhere (i.e., to another question), then partial or

complete credit was given to the first question anyway. This is best understood by considering an example, such as the following: (Questions from UH, subject #7.)

6. What was another thing she did to try to get it [the varnish] cleaned up?

Correct answer: She tried to clean it up with a sponge or dustpan.

Answer given: [She] pushed everything onto it.

8. Then what did she do?

Correct answer: She covered it up with all the furniture.

Answer given: [She] went downstairs.

12. What did she do to fix it [i.e., to keep the furniture from falling through the floor]?

Correct answer: She went down to the basement and stacked things up to the ceiling to hold up the living room floor.

Answer given: [She] asked for a new carpet.

In this case, although strictly speaking all three questions are answered incorrectly, only #6 was scored as fully incorrect: full credit was allowed for #8, because the correct answer to this question was given earlier (to #6), and partial credit was allowed for #12 because part of the correct answer to this question had been given in answer to #8. Thus, credit was given if the events of the story were remembered and understood, even if they were not listed in exactly the right order. This was

particularly important with UH, which, although not a long story, was rather complex. However, credit was given only in straightforward cases.

The overall mean score for the comprehension tests was 56.79% correct. Table 3 gives the figures in detail.

By condition. Condition TI (text + illustrations) had the highest mean score (64.28). Conditions rT and T (revised text and text only) were not far behind, with 58.56 and 56.24 respectively. Condition I (illustrations only) was by far the lowest (47.82). This indicates that (a) the children did best when reading materials which were presented in the form most familiar to them, i.e., illustrated texts, and (b) the next best thing is where all information in contained in the text (i.e., condition rT).

By story. Scores for the stories except for UH were quite close, ranging from 61.09 to 64.49. with LH scoring highest. UH scored considerably lower than the other three (42.50). This is not particularly surprising, given the complexity of the story (as reflected in its having by far the longest comprehension questionnaire).

By reading group. Scores directly reflect reading ability, as determined by the rankings assigned by the children's classroom teacher, with the low-ability readers scoring lowest (49.80), and the high-ability group scoring highest (62.33).

By dysfluency score. As with the preceding category, comprehension scores directly reflect reading ability as determined by dysfluency scores, with those children who made the greatest number of reading errors scoring lowest (51.70), and those who made the lowest number of mistakes scoring highest (65.42).

Insert Table 3 about here.

By illustration type. The two stories with redundant illustrations fared much better than the stories with crucial illustrations (62.09 vs. 50.20%).

Two- and three-way interactions.

1. Two-way. The two-way interactions considered were the following: condition/reading group, condition/story, and reading group/story. The only one that was statistically significant was condition/story, with TI and rT scoring uniformly higher than T and I for each story. Since rT and TI were the only conditions that told all four stories completely, it is to be expected that comprehension would be greater than for either T or I.

2. Three-way. The only three-way interaction considered was condition/reading group/story. It was not statistically significant.

Vocabulary Test

Results are similar when the vocabulary test score is taken as the measure of achievement, as is shown in Table 4. The overall mean was 3.75 (75%).

By condition. The mean scores for conditions TI and rT are close (3.78 and 3.64 respectively). However, condition T (text only) scored rather higher (4.43) and condition I (illustrations only) was quite low (2.82), as expected: the children in this condition had no chance to practice with these words before being tested. What is more interesting is the high score for T. Apparently in this condition, where the children had no input from illustrations, they were forced to concentrate more strongly on the text and pay more attention to the words.[2]

By story. As with the comprehension test, vocabulary scores were fairly close except for UH, which was considerably lower, undoubtedly due to its more difficult words. PS scored highest (4.30), probably due to its very easy test.

By reading group. Scores directly reflect reading ability as determined by the classroom teachers, with the poor readers scoring lowest (2.70) and the best readers scoring highest (4.66).

By dysfluency score. Vocabulary scores also directly reflect reading ability as determined by dysfluency scores, with those children who made the most reading errors scoring lowest

(2.92) and those who made the fewest errors scoring highest (4.73).

Illustration type. The type of illustration had no effect on vocabulary scores: the mean score for each was 3.68, thus indicating that in this parameter reinforcement (or lack thereof) from illustrations is irrelevant.

Insert Table 4 about here.

Two- and three-way interactions.

1. Two-way. The same two-way interactions were considered here as with the comprehension scores (see above). Of these, one was significant: condition/reading group. Not surprisingly, for each condition, the good readers scored highest and the poor readers scored lowest.

2. Three-way. The same three-way interaction was considered here as with the comprehension test. It was not significant.

The results of the comprehension and vocabulary tests are, for the most part, quite similar. For both tests, the low reading group ranked lowest and the high group scored highest. Also, for both tests these scores were closely reflected by the dysfluency scores. In both tests, the I condition averaged by far the lowest: on the comprehension test the mean score for I (47.82) was almost 8.5 percentage points lower than the mean

score for T, the next-lowest condition, which had a mean of 56.24%. This is greater than the difference between T and TI, the highest-scoring condition (64.28). The other three conditions were more closely spaced. Similarly, on the vocabulary scores, the difference between the mean score for I (56%) and rT, the next lowest condition (73%) is 17 percentage points. This is greater than the difference between the mean score for rT and T, the highest scoring condition (89%). That difference is 16 percentage points. For both tests, the two middle-scoring conditions were closely bunched. A similar situation is found with regard to story. For both tests, UH scored by far the lowest. This is especially pronounced for the comprehension test. The scores for LH, PS, and PJ are close--only a 3.4 percentage-point difference exists between the highest (LH, with 64.49%) and the lowest of these three (PJ, with 61.09%). However, between PJ and UH the difference is 18.59 percentage points. For the vocabulary test, the difference between UH (with 63%) and the next highest-scoring story (LH, with 74%) is 11 percentage points. But the difference between LH and PS, the highest scoring story, is only 12 percentage points. So here, as with the comprehension test, we find a fairly close bunching of PJ, PS, and LH, with UH far below. In both cases, this is probably due to the relatively greater complexity and more difficult vocabulary of UH.

The most striking difference between the comprehension and vocabulary scores is seen in the means for reading group and dysfluency. In all cases, the percentages are much higher for vocabulary, e.g., the below average dysfluency group had a higher percentage of correct answers on vocabulary (58%) than the highest dysfluency group on the comprehension test (45%). Similar differences are seen with reading group. This is not at all surprising: the comprehension test is obviously far more difficult than the vocabulary test and provides far more opportunities for error. The other source of differences lies in how the stories and conditions ranked among themselves. In no case did a story or condition occupy the same rank for both tests, except condition I and story UH which, as discussed above, consistently ranked by far the lowest in all cases. Only one pattern can be discerned, which may well be coincidence, and of no consequence. If we look at comprehension scores for story and vocabulary scores for condition, and then vocabulary scores for story and comprehension scores for condition, the same story is always in the same rank with a particular condition, e.g., the comprehension score for LH ranks the same as the vocabulary score for (first); the comprehension score for PS ranks the same as the vocabulary score for TI (second); and the comprehension score for PJ ranks the same as the vocabulary score for rT (third). Note that the reverse pairs are also found: the vocabulary score for LH is the same rank as the comprehension score for T (third), the

vocabulary score for PS ranks with the comprehension score for TI (first), and the vocabulary score for LH ranks with the comprehension score for rT (second). (Of course, UH and I, always being lowest, also pair up like this.) This is a rather odd sort of pattern and may be simply a coincidence. In any case, we can discern no significance for it, nor can we offer any (rational) explanation for it.

Discussion

Now let us consider how our specific predictions compare with the data. As was discussed above, we predicted that good readers will have learned to rely on the text for information and to ignore illustrations. Thus, they should ignore crucial illustrations, and should find texts accompanied by such illustrations to be more difficult to read than texts which had redundant illustrations or none at all. On the other hand, we predicted that if poor readers, either as a cause or an effect of their low reading ability, tend to rely on illustrations for content, they should find texts with crucial illustrations and texts with redundant illustrations about equally easy (or difficult). In addition, poor readers would be aided by the presence of illustrations of either type, and thus would find illustrated texts uniformly easier to read than unillustrated texts. In other words, we predicted that the reading performance of poor readers would be affected by the presence or absence of illustrations, whether crucial or redundant in nature,

whereas good readers' performance would be affected by the type of illustrations present. This means that poor readers should do better on condition TI than on T, while good readers would do better on conditions TI and T when the illustrations were redundant and less well on both TI and T when the illustrations were crucial, as represented schematically in Table 5.

Insert Table 5 about here.

If our hypothesis is correct, for the good readers, the averages for TI and T will be quite close for each story, thus indicating that the presence or absence of illustrations has little effect on their comprehension scores. For poor readers, on the other hand, the average for TI should be considerably higher than that the average for T, thus reflecting that the absence of illustrations can be expected to have a more pronounced negative effect on the reading comprehension scores of poor readers than it does for good readers. And, as Table 6 indicates, this is exactly what we do find: for poor readers, Average TI is 60.15 and Average T is 42.38, while for good readers Average TI is 65.76 and Average T is 61.92.

If our hypothesis is correct, for good readers, the average score for stories with crucial illustrations (Average C) should be considerably lower than the average score for stories with redundant illustrations (Average R), which would reflect that

good readers' comprehension was adversely affected by texts that depend on crucial illustrations for coherence. For poor readers, however, we predicted that the difference between Average C and Average R would be less, thus indicating that for poor readers, the type of illustration is of less importance than the presence or absence of illustrations. And once again we find this to be so: for poor readers, Average R is 54.40 and Average C is 48.13 (a six-point difference), while for good readers, Average R is 71.26 and Average C is 56.42 (a fifteen-point difference).

One very odd result needs to be mentioned. This is the average score for the good readers on story PJ, condition TI (54.25%). It is more than twenty points lower than the same group's average score for the same story in condition T (74.42). Since PJ is a story with redundant illustrations, we predicted that, for good readers, the scores for this story should differ little between these two conditions. Clearly this score does not uphold our prediction, unlike all the other scores. This score is especially anomalous in that for the same story, same condition, the poor readers scored higher, with 68.25%. After doublechecking the data printout and hand checking the original answer sheets, however, no error could be found. We conclude, then, that this score is simply an anomaly for which we have no explanation at this time.

Aside from this, our hypothesis is strongly substantiated: for poor readers the presence or absence of illustrations

(Average TI vs. Average T) had a much stronger effect on comprehension scores than did the type of illustrations (Average R vs. Average C), while the reverse is true for good readers.

Insert Table 6 about here.

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Footnotes

[1]Of course, these are not intended to be interpreted entirely without words. They appear to be intended as stimuli for discussion, for inventing stories.

[2]The score for T is .79 of a point higher than that for rT, where illustrations were also not present. This is possibly a reflection of the fact that rT contained only the two stories with crucial illustrations--one of which (UH, with a mean vocabulary score of 3.13) was by far the most difficult of the four stories for the children both to read and understand, and its vocabulary test (varnish, dustpan, floor, rug, furniture) was more difficult than any of the others (see below). This may explain the low score for rT. On the other hand, rT also contained PS, the story which was by far the easiest for the children to read, with the easiest vocabulary test (down, little, home, ride, good-by), and, not surprisingly, the highest mean vocabulary score (4.30). These extremes, then, should cancel each other out, making these two stories, taken together, score roughly the same for vocabulary as do PJ and LH taken together--and this is indeed the case (see Table 4 and below). This means that the difficulty of UH cannot alone account for the lower scores for the rT condition in relation to the T condition.

Table 1

Materials

Title and Author	Publisher and Year	Length in words	No. of Illustrations	Words/ Illustration	Fry Score	Spache Score	Illustration Type
1. Unfortunately Harriet (Rosemary Wells)	Dial Press, 1972	210	19	11.05	3-	2+	crucial
2. The Pet in the Jar (Judy Stang)	Golden Press, 1975	605	23	26.30	2	2+	redundant
3. Play School (--)	Allyn & Bacon, 1961	256	9	28.44	1-	1-	crucial
4. Little Hippo (Frances Allen)	Scott, Foresman, Daisy Days, 1978	180	5	36.00	1-	2	redundant

Note. 1 and 2 are tradebooks; 3 and 4 are taken from basal readers.

Table 2

Comprehension Questionnaires: Question Types Per Story

Story	No. of Q's	Cond.	Answer available from: Text	Illus.	Both	Answer not available from either	Direct from Text or Illus.	Inference from Text or Illus.	Mixed*
Unfortunately Harriett	22	T	17(77%)	0(0%)	0(0%)	5(23%)	13(59%)	4(18%)	0(0%)
		I	0(0%)	16(73%)	0(0%)	6(27%)	9(41%)	7(32%)	0(0%)
		TI	9(41%)	4(18%)	9(41%)	0(0%)	14(64%)	5(23%)	3(14%)
		rT	22(100)	0(0%)	0(0%)	0(0%)	18(82%)	4(18%)	0(0%)
The Pet in the Jar	15	T	15(100)	0(0%)	0(0%)	0(0%)	13(87%)	2(13%)	0(0%)
		I	0(0%)	9(60%)	0(0%)	6(40%)	5(33%)	4(27%)	0(0%)
		TI	7(47%)	0(0%)	8(53%)	0(0%)	12(80%)	2(13%)	1(7%)
Play School	13	T	12(92%)	0(0%)	0(0%)	1(7%)	8(62%)	4(31%)	0(0%)
		I	0(0%)	10(77%)	0(0%)	3(23%)	3(23%)	7(54%)	0(0%)
		TI	6(46%)	1(8%)	6(46%)	0(0%)	5(38%)	3(23%)	5(38%)
		rT	13(100)	0(0%)	0(0%)	0(0%)	10(77%)	3(23%)	0(0%)
Little Hippo	14	T	14(100)	0(0%)	0(0%)	0(0%)	9(64%)	5(36%)	0(0%)
		I	0(0%)	9(64%)	0(0%)	5(36%)	3(21%)	6(43%)	0(0%)
		TI	5(36%)	0(0%)	9(64%)	0(0%)	5(36%)	5(36%)	4(29%)
Average per Story:									
Unfortunately Harriett	22		12(55%)	5(23%)	2(9%)	3(14%)	14(64%)	5(23%)	.75(3%)
The Pet in the Jar	15		7(47%)	3(20%)	3(20%)	2(13%)	10(67%)	3(20%)	.33(2%)
Play School	13		8(62%)	3(23%)	1.5(11%)	1(8%)	6(46%)	4(31%)	1(8%)
Little Hippo	14		6(43%)	3(21%)	3(21%)	2(14%)	6(43%)	5(36%)	1(7%)
Average per condition:									
T(N=64)			58(91%)	0(0%)	0(0%)	6(9%)	43(67%)	15(23%)	0(0%)
I(N=64)			0(0%)	44(69%)	0(0%)	20(31%)	20(31%)	24(38%)	0(0%)
TI(N=64)			27(42%)	5(8%)	32(50%)	0(0%)	36(56%)	15(23%)	13(20%)
rT(N=35)			35(100)	0(0%)	0(0%)	0(0%)	28(80%)	7(20%)	0(0%)

*This refers to answers which are available directly from the text AND by inference from the illustrations or vice versa.

Table 3

Mean Comprehension Scores (in percentages of answers correct)

Overall mean:	56.79 (N=167)
Condition:	
TI:	64.28 (N=25)
rT:	58.56 (N=25)
T:	56.24 (N=56)
I:	47.82 (N=40)
Story:	
LH:	64.49 (N=35)
PS:	62.19 (N=50)
PJ:	61.09 (N=34)
UH:	42.50 (N=48)
Reading group (as assigned by classroom teachers)	
Low:	49.80 (N=43)
Medium:	56.47 (N=66)
High:	62.33 (N=58)
Reading ability (as determined by dysfluency scores):	
Overall mean:	56.11 (N=127)*
Below average:	51.70 (N=37)
Average:	60.30 (N=45)
Above average:	65.42 (N=45)

*As indicated above, 40 children participated in the I (illustrations only) condition and thus had no dysfluency scores and are therefore not considered in this section.

Table 4

Mean Vocabulary Scores (numbers and percentages of words correctly decoded)

Overall mean:	3.75 (N=167)	(75%)
Condition:		
T:	4.43 (N=56)	(89%)
TI:	3.78 (N=46)	(76%)
rT:	3.64 (N=25)	(73%)
I:	2.82 (N=40)	(56%)
Story:		
PS:	4.30 (N=50)	(86%)
PJ:	3.85 (N=34)	(77%)
LH:	3.71 (N=35)	(74%)
UH:	3.13 (N=48)	(63%)
Reading group (as assigned by classroom teachers):		
Low:	2.70 (N=43)	(54%)
Medium:	3.64 (N=66)	(73%)
High:	4.66 (N=58)	(93%)
Reading ability (as determined by dysfluency scores):		
Overall mean:	4.04 (N=127)*	(81%)
Below average:	2.92 (N=37)	(58%)
Average:	4.27 (N=45)	(85%)
Above average:	4.73 (N=45)	(95%)

*As indicated above, 40 children participated in the I (illustrations only) condition and thus had no dysfluency score and are not considered in this section.

Table 5

Expectations

	Poor Readers		Good Readers	
	Illus. present (TI)	Illus. absent (T)	Illus. present (TI)	Illus. absent (T)
Redundant	easy	hard	easy	easy
Crucial	easy	hard	hard	hard

Table 6

Comprehension Scores, Good and Poor Readers*

Illus. Type	Story	Poor Readers: Illus. Present (TI)	Poor Readers: Illus. Absent (T)	Good Readers: Illus. Present (TI)	Good Readers: Illus. Absent (T)
Red.	PJ	68.25	35.00	54.25	74.42
Red.	LH	64.33	50.00	79.50	76.83
	Average:	66.29	42.50	66.88	75.63
Cruc.	UH	38.75	33.00	53.25	36.25
Cruc.	PS	69.25	51.50	76.00	60.17
	Average:	54.00	42.25	64.63	48.21

Poor Readers				Good Readers			
Average TI:	60.15	Average T:	42.38	Average TI:	65.76	Average T:	61.92
Average R:	54.40	Average C:	48.13	Average R:	71.26	Average C:	56.42

Average TI = average score for all four stories in TI condition; Average T = average score for all four stories in T condition.
Average R = average score for the two stories with redundant illustrations in both conditions; Average C = average score for the two stories with crucial illustrations in both conditions.

*"Good" and "poor" readers here refers to the reading groups as assigned by classroom teachers. The average, or middle, group was not considered.

APPENDIX A

Text of a Tradebook with Crucial Illustrations

HI, CAT

by Ezra Jack Keats

On his way to meet Peter,
Archie saw someone new on the block
"Hi, cat," he said as he walked by.
He looked at his reflection in a store window.
Peter was waiting at the corner.
"Make way for your ol' gran'pa,"
Archie said in a shaky voice.
He looked Peter up and down.
"My, my, Peter, how you've grown!"
"Why, gran'pa," Peter said.
"It's good to see you."
"Hello, my children," Archie croaked.
"Hi, gran'pa!" Susy giggled.
Willie was so happy to see Archie
he ran over and licked his face.
Archie tasted delicious!
Willie licked and licked and licked.
"No respect for old age!"
Archie whispered something to Peter and ran off.
"Stick around, folks," Peter called.
"We have a surprise for you."
When Archie got back,
he and Peter worked
while everyone waited.
"OK!" Peter announced.
"Make way for Mister Big Face!"
A big paper bag appeared.
Then a tongue stuck out of one of the eyes!
A hand came out of an ear
and motioned everyone to move closer.
They all obeyed.
Suddenly the bag began to shake.
It shook harder, and harder, and
MEEOOW!
People started to leave.
"Wait--Wait--the show'll go on!
See the tallest dog in the world
take a walk!" Archie shouted.
"Some show, gran'pa!"
"Some tall dog!"
"Who ate your mustache, gran'pa?"
Everyone walked away, laughing.
Soon no one was left except Archie, Peter,
Willie and the torn paper bag.
"It would have been great
if it wasn't for that crazy cat," said Peter
"Mmmm," said Archie. "He sure stuck around."

". . . and all I sad was 'Hi cat,'" said Archie
finishing his story.
"You're well rid of a cat like that,"
said his mother.
Archie thought for a while.
"You know what, Ma?" he said.
"I think that cat just kinda liked me!"

APPENDIX B

Unaltered Texts of Stories

Used as Experimental Materials

UNFORTUNATELY HARRIET

by Rosemary Wells

Unfortunately Harriet spilled the varnish right in the middle of the new brown rug. She tried to clean it up with a sponge, but that only made it spread.

Then she tried scooping it up with a dustpan, but that made it still worse.

"Go away!" she shouted. But it didn't.

"Something very big better go over that spot," thought Harriet. "Then maybe they won't find it until after it dries."

CREAK! went something.

"Oh, dear," thought Harriet, "that bunch of stuff's too heavy. It's going to fall right through the floor!"

"There! That should hold up the living-room floor for now," she said.

Harriet was very tired. She washed her hands in the kitchen sink. "Oh, dear!" she said. "The varnish won't come off my hands. It's too sticky. Supposing it sticks to the bottom of the furniture!"

Harriet moved the furniture away from the spot. "Oh, dear," she moaned, "Mother will be so angry when she comes home. What shall I do?" She thought about running away when someone knocked.

"New rug!" said the man.

"But the new rug's already here," said Harriet.

"Nope," said the man. "The new rug goes on top of the brown rug--saves on your wear and tear."

"How very nice," said Harriet.

THE PET IN THE JAR

by Judy Stang

"No pets!" The sign on Jeremy's house said that. But Jeremy wanted a pet. With all his heart he wished for one.

Then one day something fell from a tree onto Jeremy. A caterpillar! A big black and yellow caterpillar. It had fuzzy things that stood up on its back.

Jeremy watched the caterpillar walk up his arm. Then he smiled. A caterpillar would make a very good pet. It would never make any noise. No one would have to know about it. It could live in a jar under the bed--in Jeremy's room.

Jeremy put leaves in his pockets. He picked a very small branch. Then he made a little basket of his hands. He carried the caterpillar home. He named him Jake.

Jeremy found a jar. He put the leaves into it. He put the little branch on the leaves. Then he put Jake into the jar.

Jeremy wondered if Jake would be happy in the jar.

Jake walked all over inside the jar. He climbed up on the little branch. He looked all around his new home.

Jeremy watched him for a long time. Then he put a paper cover on the jar. He made little holes in the cover. Now Jake could not run away. But he could have air.

Every day Jeremy picked fresh leaves for Jake's supper.

Every afternoon Jeremy let Jake out of the jar. Jake liked to climb up and over and around things. So Jeremy put out climbing things for Jake.

Jeremy lay on the floor. He watched Jake. Jake climbed to the top of the room. Then he walked down to the floor again.

Jeremy showed Jake how to do a trick. Jake stood up on Jeremy's hand. Then Jake danced a little in the air.

The end of the trick was best. Jake waved himself over to Jeremy's other hand.

For weeks and weeks Jeremy and Jake played together. Then one day, Jake would not come out of his jar. He would not move from his branch. He began to make a thing around himself. It was like a little house without windows or doors. Now Jeremy could not see him.

Jeremy did not know what to do. He brought leaves to Jake every day. But Jake never came out to eat them. He called Jake's name. At times the house moved a little. But Jake did not come out.

Then one day, Jeremy peeped into the jar. He saw a small hole in the top of the house.

"Jake is coming out!" Jeremy said. "He wants to play with me again. He will do his trick."

Jeremy watched. The hole in the house grew bigger and bigger.

Now Jeremy would see Jake again.

But a black and yellow butterfly came out of the little house. He held himself upside down. He slowly moved his wings.

Jeremy did not know what to do. He still loved Jake, even if Jake had turned into a butterfly. But--would Jake the butterfly be happy in a jar?

Jeremy watched as Jake tried to fly. Jake's wings bumped the sides of the jar.

Jeremy was not happy. "Jake will get hurt," he said. So he put the jar in an open window. Jake climbed to the top of the

jar. He held out his wings, and he flew. First he flew around Jeremy's head. Then he flew out the window.

"Good-bye, Jake," said Jeremy. Jeremy was not happy at all.

Jeremy sat down with Jake's jar. He thought he would hold it. He would make believe that Jake was still in it. Then maybe he would not miss his pet so much.

Then Jeremy had a better idea. He ran to the park. He began to look for a fat caterpillar like Jake. The new caterpillar would be happy in the jar. He would stay there a long time.

Then, one day, the new caterpillar would become a butterfly, too--just like Jake!

WE GO TO SCHOOL

(from Our School, Allyn & Bacon)

"Good-by, Ricky," said Bill. "Away I go to school. Good-by! Good-by!"

"Good-by, Ricky," said Linda. "Away I go to school, too. Good-by! Good-by!"

Ricky said, "Jump in, Midnight. Jump in and ride with me. We will go to school, too."

"Good-by, Rags," said Ricky. "Away we go to school. Good-by! Good-by!"

"Ricky! Ricky!" said Mother. "Come home, Ricky. You cannot go to school. You are too little."

"Come, Midnight," said Ricky. "We cannot go to school. We are too little. We will go and play with Rags. We can play school at home."

"My, my," said Mother. "I see a little school."

Ricky said, "Come in, Mother. This school is my play school. Rags comes to this school. Midnight comes to this school. And you can come to this school."

"Help! Help!" said Mother. "Down I go!"

"Mother, Mother," said Ricky. "This is funny! We cannot go to school. We are too little. And you cannot play school. You are too big."

LITTLE HIPPO

by Frances Allen

Little Hippo lived in the city zoo with his mother.

He had fun in his pond. He liked to make the children laugh.

But one day some workers came. They took Little Hippo's mother away. And he was all alone.

That night Little Hippo cried.

The next day Little Hippo cried. He could not stop crying.

"Why are you crying?" asked a ladybug.

"My mother went away, red thing," said Little Hippo.

"I'm not a red thing. I'm a ladybug. I'm sure your mother will come back soon," said the ladybug.

"She's been gone a whole year," said Little Hippo.

"When did she leave?" asked the ladybug.

"Yesterday!" said Little Hippo.

"Look, here comes somebody now. Is that your mother?" asked the ladybug.

"Yes!" said Little Hippo.

"I'll say good-by. I must fly home to my children," said the ladybug.

"Look at the surprise I brought you!" said Little Hippo's mother.

"A baby sister! Can she play games?" asked Little Hippo.

"We will teach her some," his mother said. "And you will never be alone again."

And he never was.

APPENDIX C

Comprehension Questionnaires

for the Four Stories

Harriet

1. At the beginning of the story, what was the little girl doing with the varnish?
2. What was brought in while she was varnishing?
3. What happened to the varnish?
4. Where was the spill?
5. What was one thing she did to try to clean it up?
6. What was another thing she did to try to get it cleaned up?
7. What did she shout?
8. Then what did she do?
9. Why did she do that?
10. What happened that made her worried?
11. What did she think might happen?
12. What did she do to fix it?
13. What was the next thing she did to clean up?
14. What did washing her hands make her realize about the varnish?
15. What did she do after that?
16. Why was she so unhappy about the spot on the rug?
17. What did she think about doing?
18. Who came to the door while she was thinking?
19. What did he have with him?
20. What did he say about the brown rug?
21. How did that make the little girl feel?
22. Why did it make her feel that way?

Pet in the Jar

1. Why couldn't the little boy have a pet?
2. What kind of pet did he find?
3. How did he find it?
4. Why did he think it would be a good pet?
5. Where did he keep it?
6. What kinds of things did he do with it?
7. What did he feed it?
8. After a while what did it do?
9. Was it the same when it came out of the little house?
10. What was it like?
11. What did the little boy do?
12. Why did the little boy do that?
13. Was he happy to do that?
14. What did he do at first after his pet was gone?
15. Then he had a better idea. What was it, what did he do next?

Play School

1. Where did the big boy and girl go?
2. What did they say to the little boy as they left?
3. What did the little boy do then?
4. Where was he going to go?
5. Who did he say good-by to?
6. Who told him to come home?
7. Why can't he go to school?
8. What did he decide to do?
9. Who goes to his pretend school?
10. What did he invite his mother to do?
11. What happened when she sat down?
12. Why can't she go to the little boy's school?
13. Why does he think that's funny?

Little Hippo

1. Where did the little hippo live?
2. Who did the little hippo live with?
3. Who took his mother away?
4. Was anybody with the little hippo then?
5. Was he happy to be all alone?
6. What did he do?
7. Who talked to him the next day?
8. What did she ask him?
9. What did the little hippo answer?
10. How long was the little hippo's mother gone?
11. Who came toward them?
12. What did the little hippo's mother bring with her?
13. What did the little hippo want to do then?
14. Was the little hippo ever alone again?